TITLE OF THE INVENTION

BATTEN FOR LIFT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of US application number 10/274,725 filed October 19, 2002, which is a continuation-in-part of US application number numeral 10/273, 285 filed October 17, 2002, which is a divisional of US application number 09/627,537 filed July 28, 2000, now US Patent number 6,634,622.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] None applicable.

REFERENCE TO A "SEQUENCE LISTING"

[0003] None applicable.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0004] The present invention relates to a batten assembly for use in lift assemblies, and more particularly, to a batten having a cross section selected to reduce the weight of the batten while increasing a load bearing capacity along a length of the batten. The present batten reduces the number of required lift lines for vertically translating the batten and thereby reduces the weight of the batten assembly as well as reducing material, freight, installation, labor and maintenance costs.

DESCRIPTION OF RELATED ART

[0005] Battens are used to interconnect scenery, lights, props and equipment to a plurality of lift lines for vertical movement relative to a stage or

floor. Typically, the battens are connected to the lift lines, and the loads to be moved relative to the stage are then connected to the battens.

[0006] Battens have traditionally been formed of a length of pipe, wherein the pipe is connected to the lift line and scenery (load) is hung from the pipe. The current industry standard batten is a one and a half inch, Schedule 40 steel pipe. For example, US Patent 5,711,713 issuing January 27, 1998 employs a single pipe batten.

[0007] Flexing of the batten is a significant disadvantage in the rigging systems. Deflection of a portion of the batten will cause the associated scenery to hang unevenly or to be misaligned during use. Therefore, lift lines are connected to the batten at intervals selected to limit flexing or deflection of the batten under the anticipated loading. Typically, prior batten systems are connected to the lift lines on approximately 10 ft. centers.

[0008] An alternative construction which addresses batten flexing employs a plurality of pipe battens interconnected to form a truss having a generally triangular cross section so as to enhance loading capacity. Specifically, US Patent 5,361,585 issuing November 8, 1994 discloses a truss batten having a generally triangular cross section with a pipe batten at each vertex of the triangle.

[0009] While the truss batten provides enhanced rigidity to reduce deflection, the truss batten has a weight well over three times the weight of a single pipe batten. This increased weight results in increased manufacturing costs as well as increased hoist system costs. While the single pipe batten has reduced weight, it requires an increased number of lift lines to support the batten so as to limit deflection intermediate the connections to the lift lines. These additional lift lines result in increased costs in materials of the system, operation of the system, as well as maintenance.

[0010] Therefore, the need exists for a batten assembly which can provide the necessary loading capacity and resistance to deflection, while reducing the

number of required lift lines. The need also exists for a batten assembly which can readily engage the lift lines to allow trimming of the batten. The further need exists for a batten system which can permit selective movement of scenery along the length of the batten.

BRIEF SUMMARY OF THE INVENTION

[0011] The present invention includes a batten having a linear density less than the linear density of a one and a half inch Schedule 40 steel pipe batten. The present batten has sufficient rigidity (loading capacity) to reduce lift line requirements, thereby reducing the material, labor and installation cost. In addition, certain configurations of the batten can be employed to allow movement of scenery or connected loads relative along a length of the batten.

[0012] Thus, in one configuration the batten includes an elongate batten body having a cross section including a pair of spaced channel forming segments, a lower end segment and a vertical linear segment intermediate each channel forming segment and the lower end segment. The channel forming segments define spaced channel flanges and can include a curvilinear portion or length. The curvilinear lengths are selected to reduce wear on ties or couplings that extend over the top of the batten. The cross section of the batten can also include an internal strut extending between spaced segments, such as the vertical linear segments.

[0013] In the further configuration, the batten includes a batten body having a cross section at least partially defined by a peripheral wall including linear segments, wherein the batten body exhibits a greater resistance to deflection than a one and a half inch Schedule 40 steel pipe. The batten can include curvilinear upper and lower portions. Alternatively, the cross section of the batten body can include linear upper and lower portions interconnected by curvilinear side portions.

[0014] It is contemplated the batten can encompass an elongate extruded monolithic batten body having a cross section including a pair of spaced

channel forming segments extending along a longitudinal dimension of the batten body. A further configuration of the batten body includes at least one internal strut extending between spaced internal points of the peripheral wall.

[0015] Further, the batten can be employed in an assembly which includes a lift line clamp slidably received along spaced channel forming flanges of the batten body, wherein the lift line clamp includes a flange engaging leg for engaging each of the channel flanges.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0016] Figure 1 is prior art elevational view of a prior art batten and a number of lift lines to provide a given deflection under a given load.

[0017] Figure 2 is an elevational view of the current batten with a reduced number of lift lines which provides the same deflection under the same load as the system of Figure 1.

[0018] Figure 3 is a cross sectional of a first configuration of the present batten.

[0019] Figure 4 is a perspective view of a length of the batten shown in cross section of Figure 3.

[0020] Figure 5 is a cross sectional view of a second configuration of the present batten.

[0021] Figure 6 is a perspective view of a length of the batten shown in cross section of Figure 5.

[0022] Figure 7 is a perspective view showing a lift line clamp operably interconnecting a lift line and the batten.

[0023] Figure 8 is a partial cross sectional view showing a lift line clamp of Figure 7.

[0024] Figure 9 is a perspective view of the components forming the lift line clamp.

[0025] Figure 10 is a perspective view showing an end cap operably located on an end of the batten.

[0026] Figure 11 is a comparison of deflections under a given load of the present battens compared to the prior art.

[0027] Figure 12 is a cross sectional view showing the relative cross sectional sizes of the prior art and the present battens.

DETAILED DESCRIPTION OF THE INVENTION

[0028] The prior art shown in Figure 1, provides a system for theaters to raise and lower a batten 6 for moving a load, such as lighting, scenery, or other equipment relative to a stage. The batten 6 is typically a one and a half inch Schedule 40 steel pipe, having a circular cross section. As seen in Figure 1, a number of lift lines 12 are operably connected to the batten and extend to a counterweight/hoisting mechanism.

[0029] As seen in Figure 2, the present batten 10 can be employed for moving loads as in the prior art, however, a reduced number of lift lines 12 are required for the present battens.

[0030] Referring to Figures 3-6, the present batten 10 includes a batten body 20 having a cross section defined by a peripheral wall 30 having both linear and curvilinear segments.

[0031] Specifically, the batten body 20 includes spaced channel forming segments 40 which extend along a length of the batten body to define a channel 43 therebetween. Preferably, the channel forming segments 40 are defined by a curvilinear portion of the peripheral wall 30, wherein the curvilinear portion is of sufficient radius of curvature to reduce snaring and unintended engagement with connectors or couplers that may be used for suspending a load from the batten. These connectors are couplers can include ropes, straps or chains.

[0032] Each channel forming segment 40 includes a channel flange 42 extending along a length of the batten body 20. Preferably, the channel flange 42 defines a terminal end of the channel forming segment 40, and an internal shoulder 44. The channel flanges 42 can thus define a trim track extending along the top of the batten 10.

[0033] The batten cross section further includes a substantially linear vertical segment 50 depending from each of the channel forming segments 40. The vertical segments 50 can be any of a variety of dimensions, however, preferably the vertical segments have a vertical dimension of at least half the radius of curvature of a bottom segment 60, or the radius of curvature of the channel forming segments 40.

[0034] As seen in Figures 3 and 4, the bottom segment 60 interconnects the two vertical segments. The bottom segment 60 is preferably curvilinear and can define a semicircle. However, it is understood the bottom segment 60 can be faceted, elliptical or any of a variety of curvilinear profiles.

[0035] In an alternative construction of Figures 5 and 6, the bottom segment 60 defines a bottom channel 63 with internal track flanges 66. The internal track flanges 66, along with corresponding track struts 68 define a carriage track 70.

[0036] Each configuration of the batten 10 includes an internal strut 80 extending between spaced internal points of the peripheral wall 30. Preferably, the internal strut 80 is substantially perpendicular at an intersection with the peripheral wall 30. As shown in Figures 3-6, the internal strut 80 can be a horizontal member.

[0037] Although the channel forming segment 40 and the bottom segment 60 are shown as curvilinear with linear vertical segments 50, it is understood the channel forming segment and bottom segment can be substantially linear with the vertical segments being curvilinear. In such configuration, it is anticipated at least one internal vertical strut would extend from the bottom segment to one of

the channel forming segments. It is also believed that a curvilinear peripheral wall with at least one vertically oriented internal strut can sufficiently enhance the loading capability of the batten to increase spacing between lift lines, and thereby reduce weight and cost of the system. Thus, the peripheral wall 30 can be curvilinear, wherein at least one vertical linear internal strut extends between spaced locations of the peripheral wall.

[0038] As seen in Figure 7, a lift line clamp 90 cooperatively connects the lift line 12 to the batten 10. The lift line clamp 90 is slidably received between the channel flanges 42. In one configuration, the lift line clamp 90 includes a pair of jam plates 92, each plate having a flange engaging leg 94. The flange engaging leg 94 is sized to engage a corresponding one of the channel flanges 42. The jam plates 92 are selectively clamped together by any of a variety of connector means such as cams and threaded fasteners such as bolts.

[0039] As seen in Figure 9, the jam plates 92 extending along a length of the batten 10, and thus the jam plates distribute the load along a relatively large length (area), in contrast to concentrating the load at a specific point. In addition, as there is no unique operable location of the lift line clamp 90 and the batten 10, the lift line clamp can be readily located at any location along a length of the batten.

[0040] To allow an alternative connection to the lift lines 12, each lift line clamp 90 can include a hanging aperture 93 for receiving a turnbuckle or a loop of the lift line.

[0041] A carriage 110 can be disposed on the carriage track 70 for allowing translation movement of loads hung from the batten 10.

[0042] Preferably, the carriage 110 includes at least one wheel set having two wheels 112 interconnected by an axle 114. The axle 114 can be exposed to the lower channel in the batten 10 such that curtains or scenery can be affixed to the carriage 110. The carriage 110 can be readily rolled along the carriage track 70 to be operably disposed at any of a variety of locations along

the batten 10. Thus, the associated curtain can be moved along the longitudinal direction of the batten 10. It is also understood the carriage can be used to retain the load at a given location along the length of the batten 10, without imparting movement of the load relative to the batten.

[0043] Further, the carriage track 70 can also function to engage and hang scenery or lighting or equipment whose location does not need to be changed along the longitudinal dimension of the batten during use.

[0044] Referring to Figure 10, the batten 10 can cooperate with an end cap 120 cooperatively engaged with the cross section of the batten. The end cap 120 can be retained by a friction fit, or alternatively, fasteners can be employed to engage the end cap with the batten 10. In a further configuration, the end cap 120 is formed of a resilient or elastomeric material, which can include a glow in the dark compound such as photo luminescent particles. Thus, people on the stage may have they increased opportunity to identify the ends of battens 10 in a dimly lighted stage, when the battens are adjacent to stage.

[0045] In a preferred construction, the batten 10 of Figures 3 and 4 is over two times stronger and as much as 2.2 times stronger than the industry standard Schedule 40, one and a half inch steel pipe. Further, the batten 10 of Figures 3 and 4, when formed as an aluminum extrusion can exhibit approximately half of linear density of the Schedule 40, one and a half inch steel pipe batten. Further, as seen in Figure 11, while prior pipe battens 6 are supported on 10 foot centers, so as to limit deflection, the batten 10 of Figures 3 and 4 can be supported on 22 foot centers to provide the same resistance to deflection for a given load as the Schedule 40, one and a half inch steel pipe batten 6 supported on ten foot centers.

[0046] Referring to the batten 10 of Figures 5 and 6, while having a greater linear density than the batten of Figures 2 and 3, the batten has a linear density that is 20% less than the Schedule 40, one and a half inch steel pipe. Referring to Figure 11, the batten 10 of Figures 4 and 5 provides enhanced loading deflection and can provide the same deflection under a given load when

suspended on 35 foot centers, as the a Schedule 40, one and a half inch steel pipe supported on 10 foot centers.

[0047] Referring to Figure 11, a comparison of lengths of battens interconnected to spaced lift lines under a given load to exhibit a predetermined deflection is shown.

[0048] Thus, when employed in a counterweight system, the present battens, having less mass and increased rigidity, better resist deflection under load, requires fewer counterweights to balance, less starting and stopping inertia and fewer support points. For example in a 66 foot long batten, the batten 10 of Figures 3 and 4 requires three less lift lines than a comparable length Schedule 40 one and a half inch pipe batten. Thus, the batten of Figures 3 and 4 can remove three lift lines, three lift lines supports, three loft blocks and three loft block beams per set from a stage house.

[0049] With respect to respect to motorized stage hoists, the reduced weight and increased rigidity of the present battens reduces horsepower requirements, torque requirements and fewer support lines.

[0050] Further, as seen in Figure 12, the present battens 10 have at least one cross sectional dimension that is greater than the diameter of the 1½ inch Schedule 40 steel pipe batten. Thus, the battens 10 can provide increased surface area for engaging loads (by having cross sectional dimension greater than the diameter of the pipe batten 6) while having increased resistance to deflection and reduced linear density.

[0051] Referring to Figure 12, for a prior art pipe batten 6 having a given circumference (peripheral wall) it can be seen that the cross-section of the present batten 10 has a peripheral wall 30 which is at least 1.25 times longer than the given circumference, and more preferably 1.5 times the given circumference, and in a further configuration approximately 1.7 times the given circumference.

[0052] While the present invention has been described in connection with preferred embodiments, those skilled in the art will recognize that many modifications and changes can be made without departing from the true spirit and scope of the invention, which accordingly is intended to be defined solely by the appended claims.